Using the TONI-3 to Assess Cognitive Functioning of Urban Children with Learning Disabilities: A Brief Review of the Literature

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Given the paucity of research describing the use of the TONI-3 with urban children with disabilities, a brief review of the literature was conducted, while little relevant research was identified, the use of the TONI-3 was supported in a number of diverse settings. This paper also describes a study designed to examine the validity of the Test of Nonverbal Intelligence: Third Edition. TONI-3 IQs, WISC-III FSIQs and KTEA N/U–Comprehensive scores were compared and mean TONI-3 IQs were significantly higher than WISC-III PIQs, VIQs, and FSIQs, and K-TEA Reading and Mathematics Composite scores. Intercorrelations computed among TONI-3 IQs, WISC-III IQs, and K-TEA Reading and Math Composite scores indicated moderate relationships between TONI-3 IQs and WISC-III IQs (r=.591, .483, .591, respectively), and modest relationships with K-TEA Composite Scores (r=.328, Reading, r=.426, Mathematics, and r=.383, Total Battery.

The Test of Nonverbal Intelligence - Third Edition (TONI-3; Brown, Sherbenou, & Johnson, 1997) is an individually administered, norm-referenced scale which requires no language. Data supporting the validity of the TONI-3 is limited as the test manual reports just two indicators of criterion validity. TONI-3 IQs (Form A) and WISC-III Verbal, Performance, and Full Scale IQs were found to correlate .59, .56, and .63, respectively, and TONI-3 IQs (Form A) correlated .57, .75, and .73, respectively, with Verbal, Performance, and Full Scale WAIS-R IQs.

A search of the literature identified just three studies using the TONI-3 in refereed journals. The first study (Edelson, 2005) included a comparison of TONI-3 IQs and UNIT Analogic Reasoning subscale scores of 35 children with autism. No differences were obtained in overall scores, but demonstrating greater real-world knowledge of the UNIT was related to higher scores on the TONI-3.

In another study, the TONI-3 was used as one of five cognitive measures (Niehaus, Moore, Patrick, Devi, Lorntz, Lima, & Guerrant, 2002) to examine the relationship between the number of episodes of diarrhea in Brazilian children's first two years of life and subsequent level of cognitive functioning. The TONI-3 was selected for use because it had been used in comparison studies with a large group of Hispanic children with little or no English proficiency (Brown, et al, 1997). The outcome was that TONI-3 quotients were negatively related to the number of bouts of early children diarrhea (P=.-49).

In the third use of the TONI-3, Samaha and Delisi (2000) conducted an experimental study of collaborative reasoning with 86 seventh-grade,urban, minority students. Students completed the TONI-3 as a pretest and posttest. On the pretest, they also provided written explanations of their answers. The treatment was working

independently versus working in small, same-gender or mixed-gender groups. Results were mixed as most student judgments improved during the experimental phase but showed no improvement on the posttest. However, the students who collaborated provide more fully correct explanations on the posttest that did those who worked alone.

The TONI-3 has also been used as a primary measure of nonverbal intelligence in a number of dissertations. Sedore (2002) correlated TONI-3 IQs and Matrix Reasoning subtest scores of the WAIS-III of 40 college students in Eastern Kentucky and obtained a significant correlation (r = .48) which varied by age and gender. In another study designed to determine which intelligence factors affected object recognition, Guyette (2001) administered object recognition tasks (the TONI-3, and the Brief Leiter-R) to 63 subjects: 43 college students and 20 elementary students. Results indicated that vertices of objects impacted ease of identification and that age was related to recognition of objects. Also, Hopper (2002) examined the concurrent validity of the Leiter-R Brief IQ, with a sample of 46 university students. The relevant outcome was that TONI-3 IQs correlated significantly with Leiter-R IQs but nonsignificantly with WAIS-III VIQs. Using the Scholastic Aptitude Test scores and GPA to examine the predictive validity of the scales revealed that TONI-3 IQs and Quantitative SAT scores were correlated significantly (r=.41). Given the heavy verbal requirements of the SAT, thisoutcome was considered a significant finding.

Other studies included 1) examining the use of problem solving strategies and Montessori-based instruction on the promotion of problem solving and transfer (Bagby, 2002; 2) comparing Cognitive Academic Language Proficiency (CALP) in one's first and second language to nonverbal cognitive reasoning (Laiza, 2001); 3) comparing a sample of Jamaican students to the normative sample on the TONI-3 (Barrett, 2000); 4)

validating a measure of long-term visual memory in older adults (Schenck, 2000); and 5) validating the English/Spanish Bilingual Verbal Abilities Test using 90 bilingual English/Spanish speaking second and third graders (Alvaradoe, Feb.,2000).

The TONI-3 is also a highly reliable scale as test-retest correlations reported in the manual ranged from .89 - .94 for age groups 13, 15, and 19-40 years. However, little other data regarding reliability is available in the literature; hence, no additional support is provided in this paper.

Given, the limitations of the relevant literature, a study was conducted to examine the relationship among TONI-3 IQs, WISC-III Verbal, Performance, and Full Scale IQs and K-TEA: Comprehensive Form/Normative Update scores for urban children, either diagnosed with or referred for a suspected learning disability. Primary questions concerned the relationships and differences among the global and component scores of the scales.

Method

Sample

Subjects were 75 African-American students, 41 males and 34 females attending an urban school district in the southeast. Their ages ranged from 7 years, 9 months to 16 years, 5 months, ($\overline{X}$ = 10.7, SD = 2.45). They constituted all of the students in a given year from selected schools who were served by the evaluators. These students were either referred for evaluation or were re-evaluated while receiving special education services for a specific learning disability. The evaluations were conducted during one school year.

Instruments

Tests administered were the TONI-3, the WISC-III, and the KTEA – Comprehensive Form/Normative Update. However, the K-TEA Spelling subtest was omitted from the test battery. These tests are all well known so a description of them is not included in this paper. All assessments were conducted during one school year by the senior author who is a certified School Psychologist. Standard assessment practices were observed and the test outcomes were deemed to be reliable and valid.

Results

Descriptive statistics for the TONI-3 IQs, WISC-III IQs, and K-TEA Composite and subtest scores are presented in Table 1. It is noteworthy that both cognitive ability and achievement scores are depressed relative to the norm group, and the often documented manifestations of specific learning disabilities are apparent in the lowered composite and scale scores. Further, the variability of the student's scores is attenuated on all of the respective tests.

TABLE 1

Means, Standard Deviations for TONI-3, WISC-III, and K-TEA scores.

TEST	M	SD
TONI-3 IQ	90.50	10.92
WISC-III Full Scale IQ	80.38	9.81
Verbal Scale IQ	81.41	11.00
Performance Scale IQ	82.55	11.49
K-TEA		
Reading Composite	80.67	10.94
Mathematics Composite	76.79	10.66
Mathematics Applications	76.36	10.06
Reading Decoding	82.40	10.87
Reading Comprehension	80.78	11.40
Mathematics Computation	79.00	12.08

To assess whether the mean scores of the TONI-3, WISC-III, and the K-TEA differed, t-tests for dependent measures (using Bonferroni's inequality to control for the type 1 error) were computed between selected pairs of means. Examination of Table 2 indicates that all differences were significant as TONI-3 IQs were significantly higher than WISC-III FSIQs,VIQs, and PIQs, K-TEA Reading Composite and Mathematics Composite scores.

TABLE 2

t-values for TONI-3 IQs versus WISC-III FSIQs, VIQs, PIQs & K-TEA Reading and Mathematics Composites

Comparison	N	t	p
1. TONI-3 & FSIQ	75	8.54	<.001
2. TONI-3 & VIQ	75	6.80	<.001
3. TONI-3 & PIQ	75	5.67	<.001
4. TONI-3 & K-TEA Reading Composite	75	6.41	<.001
5. TONI-3 & K-TEA Mathematics Composite	75	9.93	<.001

P<.001

TABLE 3

Pearson Correlations among TONI-3 IQs, WISC-IQs, and K-TEA Comprehensive Scores

	WISC-III FSIQ	WISC-III VIQ	WISC-III PIQ	K-TEA READING COMP	K-TEA MATH COMP	K-TEA TOTAL BATTERY
TONI-3 IQs	.591*	.483*	.591*	.328*	.426*	.383
K-TEA Reading K-TEA Mathematics Comprehensive scores					.384*	.902* .658*

p<.01

A correlation matrix shown in Table 3 was generated to examine the relationships among TONI-3 IQs and WISC-III IQs and TONI-3 IQs and K-TEA scores, respectively. Correlations among the TONI-3 IQs and the WISC-III IQs were significant but moderate, accounting for modest amounts of variance: 35%, 23%, and 35%, respectively. Correlations among the TONI-3 IQs and K-TEA Composite Scores were modest, but significant, varying from .328 to .426.

These results suggest that the TONI-3 and the WISC-III will differentially portray the intellectual capabilities of children with learning disabilities. The fact that the TONI-3 IQs and WISC-III FSIQs share about 35% of the variance suggests that they possess reasonable shared variance but also indicates that they are assessing a number of different abilities. It is also interesting that the relationship between the TONI-3 IQs and WISC-III VIQs is lower than that between the TONI-3 IQs and the WISC-III FS IQs and the WISC-III PIQs. While these relationships are attenuated by the homogeneity of the sample, these outcomes probably reflect the nonverbal nature of the TONI-3.

Finally, the TONI-3 portrays the cognitive ability of these urban students with learning disabilities in a more favorable way than does the WISC-III. This differential portrayal is a long debated issue since some school personnel contend that these students need to appear at risk for school failure in order to better ensure placement and thereby increase the services provided to them. Others maintain that regular education teachers need to perceive students with learning disabilities as being more academically capable than is suggested by their classroom grades. Perceiving students as more academically capable is thought to eventuate in teachers holding higher expectations for student achievement. Hence, a test that enhances that effect may be perceived to possess more by classroom teachers. Practitioners, then, have a choice whether to present students as

capable of a higher level of intellectual functioning using non-verbal measures such as the TONI-III, as opposed to the lower scores that are more likely to be obtained on the Wechsler scales.

The primary assets of the TONI-3 are its ease of administration, wide age range, lack of an overt language requirement, and brevity. However, the scale measures a single indicator of intelligence – the ability to solve novel abstract problems, and this ability is assessed using abstract/figural problems. This limitation suggests that test users should consider the TONI-3 when time restraints and ease of administration are major considerations. However, they should be aware that they will obtain an abbreviated sample of the child's cognitive capabilities.

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